



5050 El Camino Real, Suite 108  
Los Altos, CA 94022  
(650) 963-9743  
[echiu@InSciTech.com](mailto:echiu@InSciTech.com)

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**Via email:** julia.kuan@romanoandkuan.com

Julia Kuan, Esq.  
Romano & Kuan, PLLC  
600 Fifth Ave., 10<sup>th</sup> Floor  
New York, NY 10020

**Subject: Lopez v. City of New York  
InSciTech Project No. 7702**

Dear Ms. Kuan,

Please accept this letter as my evaluation and report concerning the above-captioned matter. In this regard, I have reviewed the following case-specific materials:

- Summary of hearing of Ofc. Luis Linares (DEF\_00211 and DEF\_00212)
- Summary of hearing of Ofc. Luis Angeles (DEF\_00213 and DEF\_00214)
- Depositions
  - Luis Linares, taken March 28, 2018, and Exhibits 5 and 6
  - Eliezer Lopez, taken February 6, 2018 and March 20, 2018, and Exhibits 1-11
  - John Moise, taken April 17, 2018
  - Dennis Wong, taken October 24, 2018, and Exhibits 1-2
  - Ludwig Loy, taken October 24, 2018, and Exhibits 1-2
  - Luis Angeles, taken April 20, 2018, and Exhibits 1-3
  - Carlos Rosario, taken November 6, 2017
  - Corey Wooten, taken December 19, 2017, and Exhibits 1-2
  - Shaniqua Clarke, taken April 17, 2018, and Exhibit 1
- 6 photos of Eliezer Lopez (IMG\_2152 through IMG\_2157)
- Photos of the area of the incident
  - DEF\_00253, DEF\_00259
  - PL007000, PL007032, PL007038, PL007040, PL07047, PL007058
  - IMG\_0492, IMG\_0498, IMG\_2579
- Eliezer Lopez medical records
  - City of New York Fire Department Prehospital Care Report
  - Jacobi Medical Center

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In particular, I will review the mechanism of injury to Mr. Lopez to assess if it is more consistent with his being **pushed** backward over the Crotona Park North railing or his **falling** or **jumping** from it.

### Accident Description

Per the testimony of Officers Linares and Angeles, the subject incident occurred on December 7, 2015, in the general area of Crotona Park and the street Crotona Park North. The following aerial views are the closest dates available on Google Earth.



Figure 1: Aerial view of the northern part of Crotona Park from Google Earth taken on September 9, 2015 – three months before the incident.

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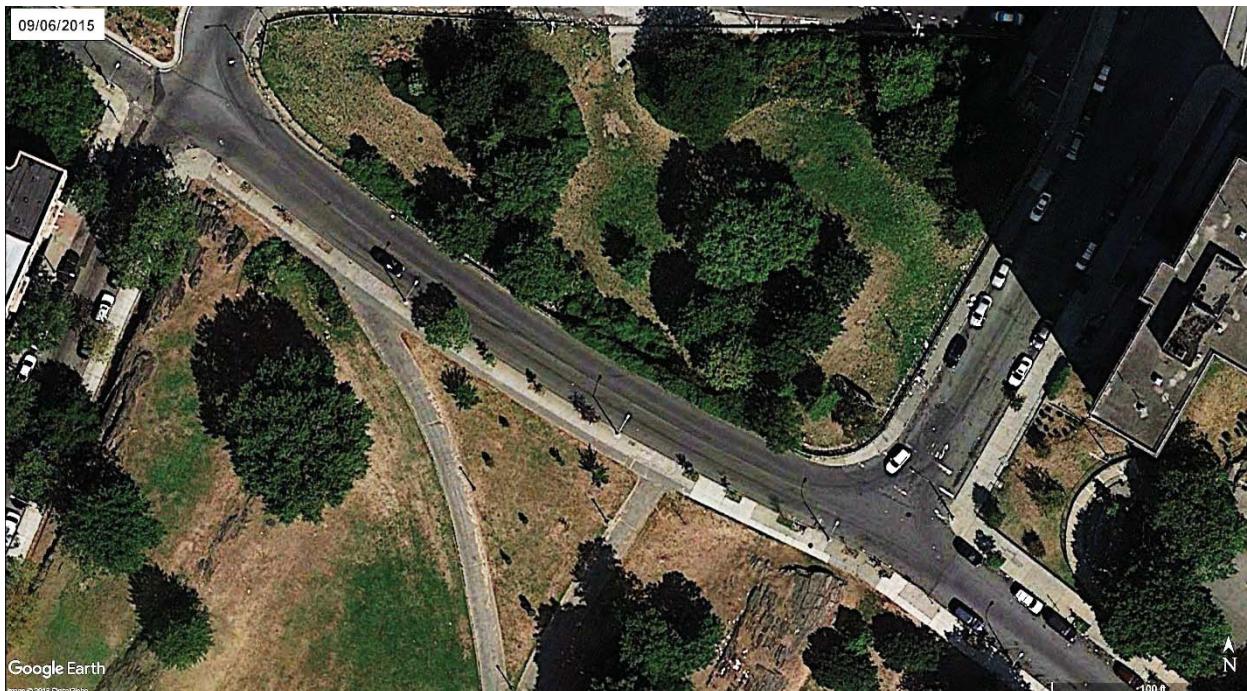


Figure 2: Closer aerial view of the northern part of Crotona Park from Google Earth taken on September 9, 2015. Crotona Park North runs from top left to bottom right in the image, and the subject railing and location of the incident are in the approximate center of the image along the north side of Crotona Park North.

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DEF\_00254

Figure 3: Photo taken by IAB on January 19, 2016, at 11:15 AM at the location of the incident.

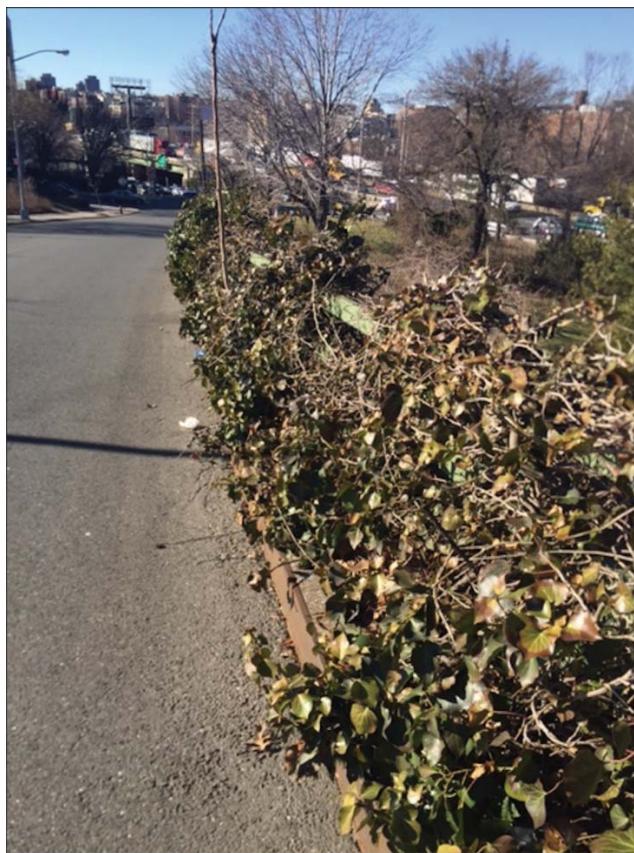
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DEF\_00259

**Figure 4:** Photo taken by IAB on January 19, 2016.



**Figure 5:** Photo of the incident site taken on February 26, 2016 – two months after the incident.

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*Testimony of Eliezer Lopez*

Mr. Lopez testified that on the day of the incident, he met his friend Gordo and planned to do heroin and cocaine in Crotona Park in the area where there are rocks. Gordo was carrying the drugs and when they got to the rocks, he began preparing them for injection. In the meantime, Mr. Lopez was taking photos and looking around. Then Mr. Lopez saw two men coming down the rocks, told Gordo that the people from the projects are coming, and began to run toward 611 Crotona Park North. The two men did not say anything when they approached. When Mr. Lopez reached the other side of Crotona Park North, he noticed that someone was behind him. He couldn't run any farther and stopped because he had reached the handrail. Then someone grabbed hold of him, he turned around, and the person spoke to him in English. Mr. Lopez replied that he didn't speak English, so the man asked him in Spanish why he was running. Mr. Lopez replied that he didn't know who the man was, after which the man took out his badge and told him that this is what happens when you run from the police. The man then shook and lifted Mr. Lopez twice, the second time completely off the ground, and pushed him. Mr. Lopez then fell backwards over his head. Mr. Lopez tried to grab the officer's hands and coat to keep from falling, but wasn't able to. The upper part of his body, his back, went over the fence first.

*Testimony of Luis Linares*

Officer Linares testified that he and Officer Angeles were partnered that day and were in plain clothes and in an unmarked vehicle. At about 2 pm, they were driving northbound on Fulton Avenue and then eastbound on Crotona Park North when Ofc. Linares observed two males in the park, standing by the rocks. He later learned that those men were Eliezer Lopez and Jose Alvarez. The officers drove past the men, parked, and approached them from behind. When they were 25-50 feet away, Ofc. Linares observed Mr. Lopez give Mr. Alvarez a small object which looked like a glassine. Ofc. Linares then went to arrest the two men. He doesn't recall what he or his partner said to them. His shield was hanging on a chain around his neck and was out. Mr. Lopez then began running and Ofc. Linares gave chase while Ofc. Angeles stayed with Mr. Alvarez. Mr. Lopez began running in a westbound direction from the rocks to a path and then northbound toward Crotona Park North. While Ofc. Linares was chasing Mr. Lopez, his shield dropped to the ground and he went back to retrieve it. When Mr. Lopez reached Crotona Park North, Ofc. Linares was still on the path and was 100-200 feet away. He then saw Mr. Lopez jump over the railing of the Cross-Bronx Bridge and try to hold onto the bushes or branches that were by the railing as he was falling. He then saw Mr. Lopez disappear and continued moving toward the railing. When he reached it, he saw Mr. Lopez lying on the ground. In his deposition, Ofc. Linares described that Mr. Lopez put both hands on the railing, "pulled his two legs around the barrier. He jumped to the side and tried to grab himself, and fell down... he did place his hand on the barrier in order to lift himself up and go over the barrier." Ofc. Linares doesn't recall which side Mr. Lopez swung his legs over, the right or the left.

*Testimony of Luis Angeles*

Officer Angeles testified that he and Ofc. Linares were traveling on Crotona Park North when Ofc. Linares mentioned that he saw two men having a conversation and that they "exchanged hand-to-hand." The officers then parked at a playground and approached the two men, who were standing at the rocks by the playground. The officers took their shields out and said "police" and

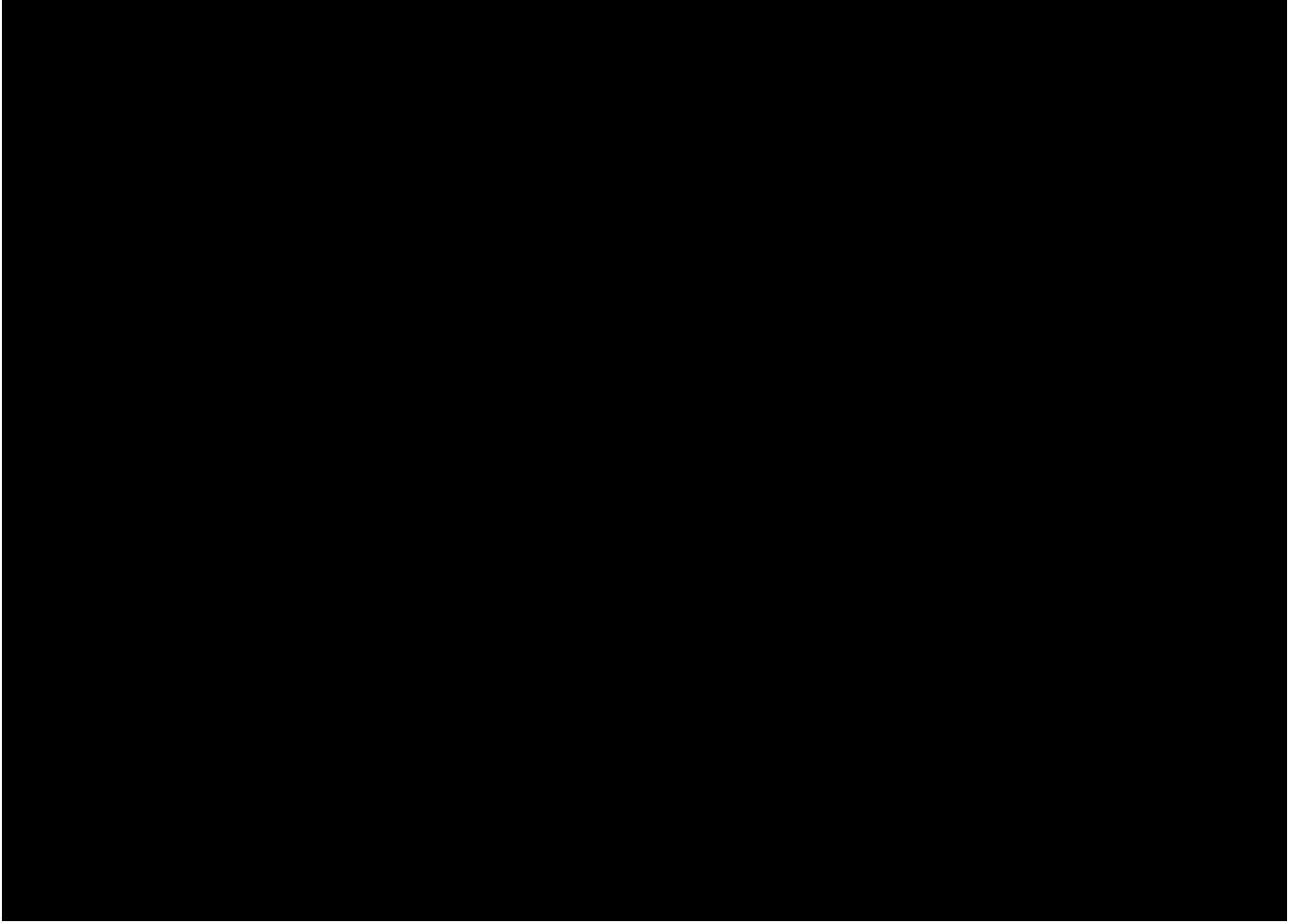
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“let me see your hands.” Both men then started running toward Fulton; the one on the left started running straight down and Ofc. Angeles chased him and arrested him. Ofc. Linares chased the other man, who ran to the right. After he handcuffed and searched his suspect, Ofc. Angeles briefly turned around and saw Ofc. Linares stopped and picking something up off the ground. Ofc. Angeles then pulled his suspect and walked toward the path in the direction where Ofc. Linares had run. When he was able to see Crotona Park North and the area of the fence, there were already police officers and cars there and he put his suspect into a police vehicle. He then walked over to where other police officers were and saw Mr. Lopez on his back on the ground and looking up. He did not see Ofc. Linares or Mr. Lopez while he was walking toward the path and did not hear anyone yell or scream out.

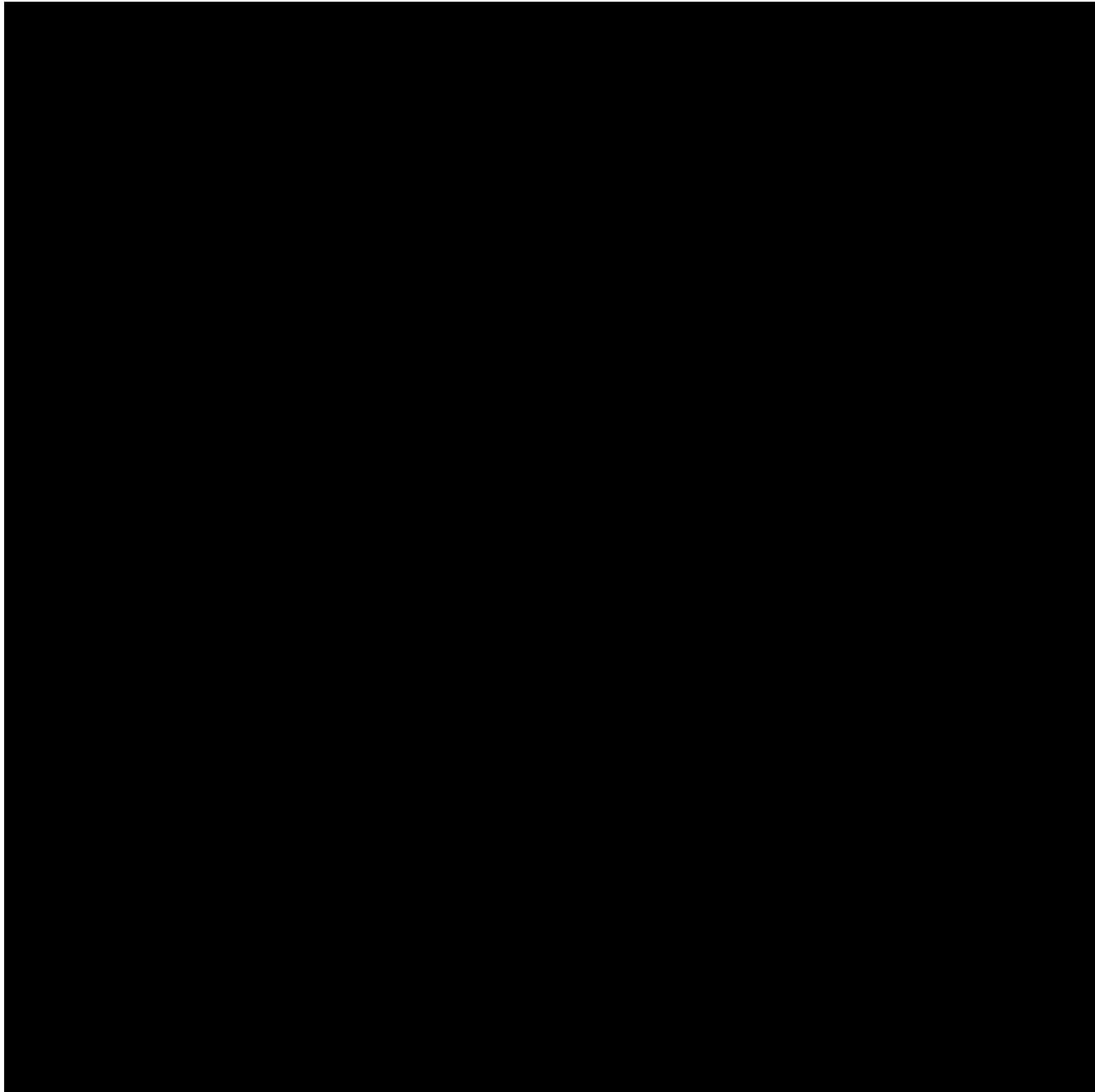
Ofc. John Moise testified that he saw Mr. Lopez on his back on the ground, with his head pointing toward the fence. Ofc. Corey Wooten described that Mr. Lopez was lying more on his side, also with his head toward the wall. Sgt. Rosario described that Mr. Lopez’ body was pointing toward the Cross-Bronx, with his feet pointed toward the park and his head toward the Cross-Bronx. He does not recall if Mr. Lopez was face down or face up.

#### **Medical Records Review**



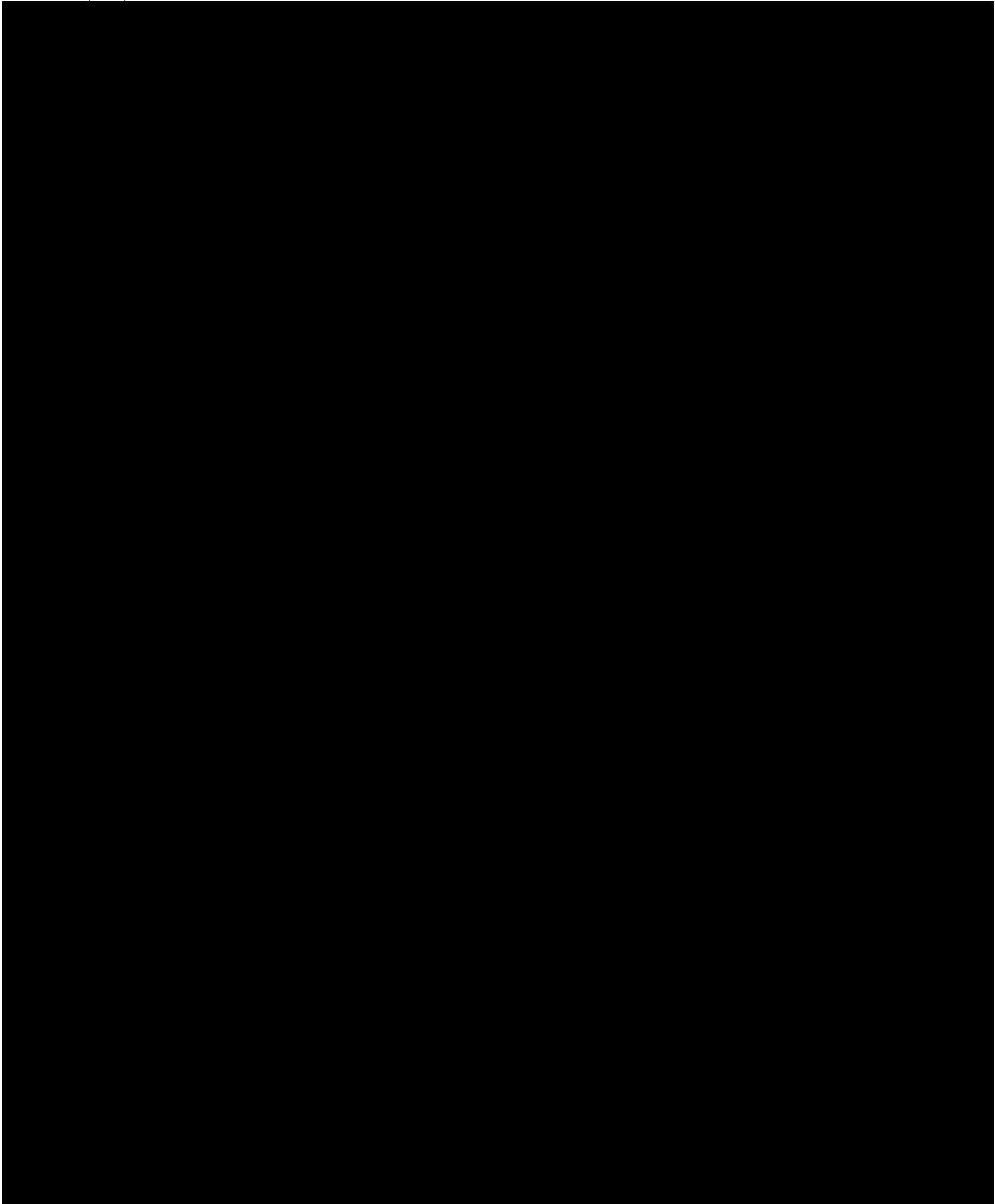
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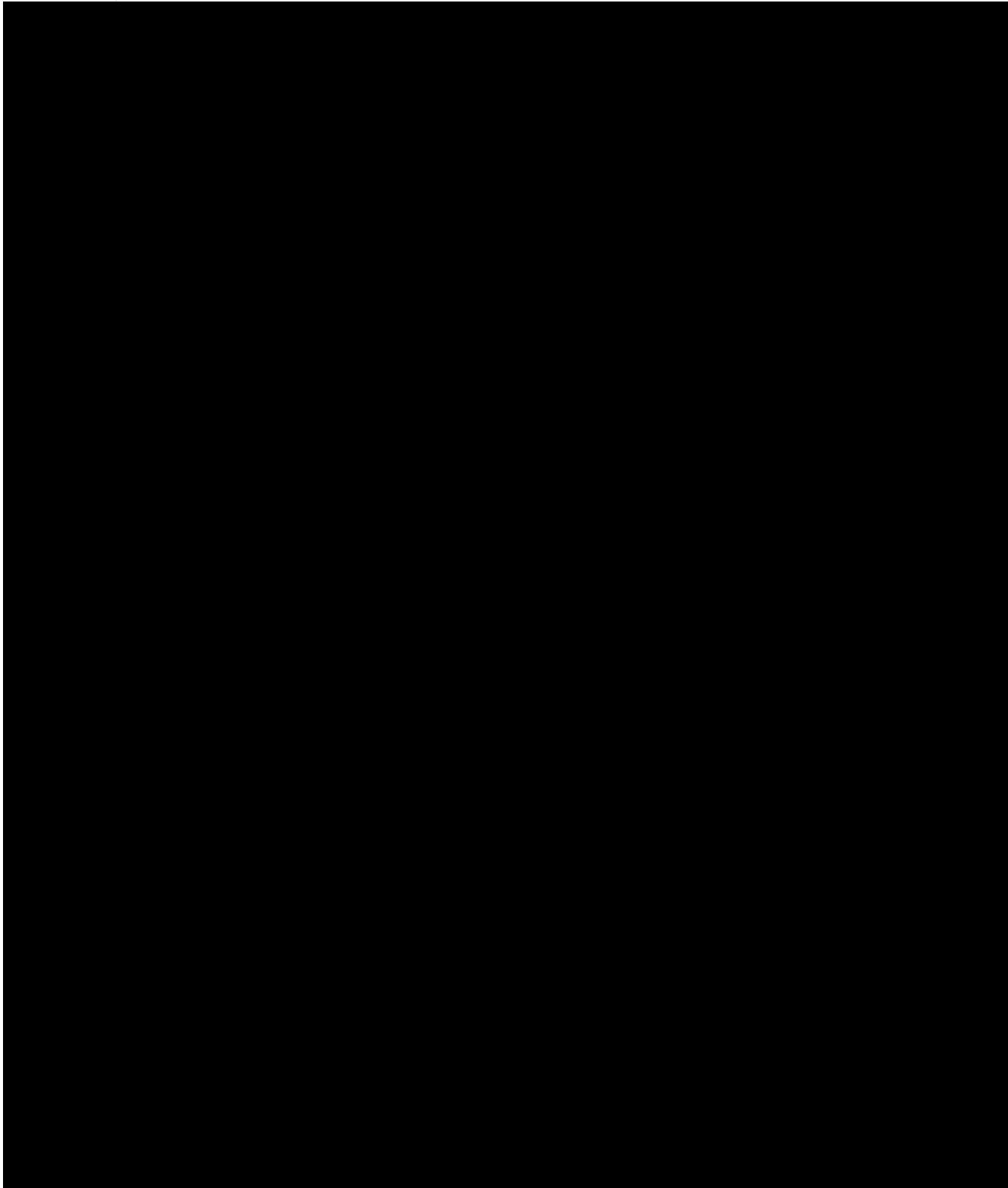
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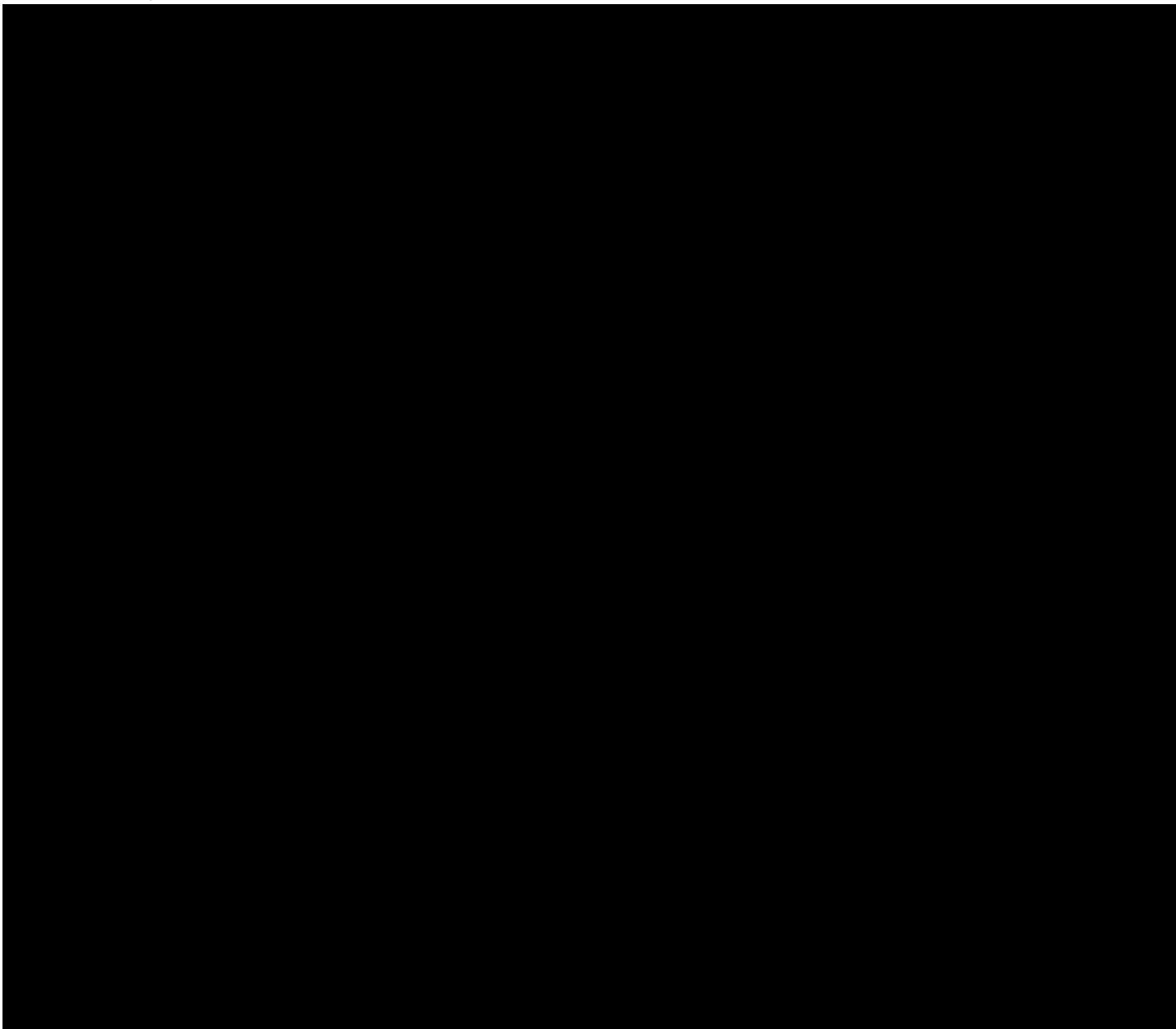
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### **Site Inspection**

On December 16, 2018, I visited the site of the incident. The following photos show the area described by the officers as the railing that Mr. Lopez fell from. The ivy had grown significantly in the three years since the incident and covered much of the railing. The sidewalk rose 6 inches from the street and the concrete and dirt base extended 18 inches from the fence. The top rail was sturdy and did not move while leaning 175 pounds of body weight against it. The height of the top of the railing was about 36 inches, though 35 inches if measured from the roots and branches of the ivy plants. A plumb line was used to measure the 16 foot distance from the top of the rail to the ground on the other side of the railing from the sidewalk. The vertical wall below the railing was concrete. No steps or shelves were found. The base of the concrete wall met the ivy and leaf covered dirt at 90 degrees.

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Figure 10: View looking down from the fence to the ground below. Photos taken December 16, 2018.



Figure 11: Photos of a 5 ft. 8 in. person standing next to the railing. The waistband is 5 inches above the top rail and the mid buttocks are aligned with the top of the rail.

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## **Analysis**

The mechanism of injury of a vertebral burst fracture is forceful axial compression (Nightingale et al. 2015). Mr. Lopez' 5<sup>th</sup> cervical vertebral body was cracked in multiple lines through the bone and fragments were pushed posteriorly into the spinal canal. At the lower cervical levels, there are only a few millimeters of space around the spinal cord. The burst fracture thus damaged the spinal cord and resulted in quadriplegia. Mr. Lopez would have had to land on his head to axially load the spine in this way.

The 4<sup>th</sup> cervical vertebral body showed anterior compression. This type of fracture is the result of flexion and compression of the spine, so Mr. Lopez' head would likely have bent forward relative to his body (Allen et al. 1992). At the C5-6 level, there is displacement of C5 posteriorly over C6. This shows gross instability of the spine and an area of further damage to the spinal cord.

Mr. Lopez stated that he was standing with his back to the railing and was pushed by Officer Linares. This would result in his falling backward, head first toward the ground. This description of the incident is consistent with the injuries sustained by Mr. Lopez – he landed on his head and flexed forward at the neck – causing the burst and anterior compression fractures of C5 and C4, respectively. Furthermore, the lack of any injuries to the lower extremities is more consistent with a head-first fall. The lack of any upper extremity injury supports a fall backward with no opportunity to break the fall with the arms.

Officer Linares reported that Mr. Lopez climbed over the fence and was grabbing onto brush with his hands before he fell. Falling this way would result in landing on the lower extremities or buttocks and cause injuries to the legs, ankles, pelvis, or lumbar spine.

An object falling under the influence of gravity has potential energy based upon the height of the object from the ground. This is calculated as mass \* gravitational force \* height, or P.E. = mgh. As the body falls, some of the potential energy is converted into kinetic energy (calculated as  $\frac{1}{2}$  \* mass \* velocity<sup>2</sup> or K.E. =  $\frac{1}{2}$  mv<sup>2</sup>). At ground level (upon impact), all of the potential energy is converted to kinetic energy. Therefore the kinetic energy upon impact is proportional to the height of the fall. Under the scenario described by Mr. Lopez, the total height of his fall was approximately 14 feet, the kinetic energy at impact was 2676 ft-lbs, and the speed at impact was approximately 20.5 mph.

From Newtonian physics, angular momentum is conserved. Therefore if a falling person has no initial angular momentum (if the person falls straight down after hanging by their hands or if he jumps straight down) then gravity acts upon his center of mass and does not impart any additional angular momentum - the person does not rotate in the air. If, however, a person is pushed and falls, his body has initial angular momentum and during the fall will continue to rotate in the same direction as the push.

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In Mr. Lopez' case, if he had been hanging by his arms and then fell, he would have fallen feet first and landed on his feet or legs. If he had been upright and his upper body was then pushed backward over the rail prior to the fall, his body would have continued rotating backward. This backward rotation could then result in a head-first orientation at impact with the ground.

Another important fact is that a fall while dangling from the hands on this railing would reduce the distance of the fall to less than 10 feet, with much reduced energy at impact. Injuries result from body tissues absorbing kinetic energy, so reduced energy at impact also reduces the potential for injury. In this case, the impact speed falling feet first would be 16.6 mph and the energy on impact would be 1765 ft-lbs.

### **Review of literature**

*Teh et al.* studied 399 patients in London who had fallen or jumped from a height. They compared the distribution of skeletal injuries between the groups and found a difference in the type of injuries. Those who jumped had a tendency to land feet first and try to break their fall on their dominant side, with more right-sided rib fractures sustained, and more pelvic and lower limb fractures with fewer skull fractures. Jumpers had more lumbar spine injuries, while fallers had predominantly thoraco-lumbar and significantly more cervical spine injuries. This supports the opinion that Mr. Lopez fell unexpectedly – was pushed.

*Mathis et al.* described the injury patterns from accidental free falls during spring break vacations in the Daytona Beach Florida area. These were predominantly lower extremity injuries, with the spinal fractures being lumbar and transverse process fractures. There were no neurologic complications found with extracranial injuries (all neurologic injuries were due to brain injuries). This supports that Mr. Lopez did not fall feet first. He had no lower extremity injuries and he sustained a cervical fracture with quadriplegia.

The center of gravity (C.G.) of an object is defined as the point within an object where the mass of the object balances out, or the point around which the forces of gravity on the body add to zero. The center of gravity of an adult male is estimated to be 0.586 \* the height of the individual (Clauser 1969). For a 173 cm. male, this is 101.4 cm. or about 40 inches. Thus, Mr. Lopez' center of gravity was above the top of the railing by at least 5 inches – 40 inches minus 35 inches to the top of the rail while standing on top of foliage. In order for him to be pushed over the top of the fence (as opposed to just being pushed into the fence) the C.G. of his body needed to be higher than the top fence rail. Given his height, his C.G. was already high enough for a push to tip him over the fence. If, as Mr. Lopez describes, Ofc. Linares also lifted him while pushing, the tendency for him to fall would have been even greater. In contrast, if Mr. Lopez' center of gravity were below the level of the fence, it would require lifting him up over the fence in order for him to fall.

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## Conclusions

In summary, based upon my education, training, and experience in the areas of Biomechanics and Emergency Medicine, combined with a review of the materials received to date, I have reached the following conclusions and hold each to a reasonable degree of scientific and biomechanical engineering certainty:

Mr. Lopez's injuries are consistent with his falling approximately 14 feet head first after being pushed backward over the railing along Crotona Park North. His cervical burst and anterior compression fractures were a result of flexion and axial compression of the spine. Mr. Lopez had to land on his head to cause these spine fractures.

Mr. Lopez's injuries are **not** consistent with his jumping over the railing feet first and then falling after hanging from the railing or the vegetation. Lower extremity, pelvis, and lumbar spine injuries would be expected with such a fall and Mr. Lopez did not suffer any of those injuries.

Mr. Lopez's quadriplegic state is a direct result of the severe neck fractures sustained on December 7, 2015.

The conclusions and analyses presented above are based upon the material reviewed to date, and may be amended or revised should further information become available. My billing rate for this matter is \$450/hour. If you require any further information regarding my analyses and report, please contact me at 650-963-9743 or at echiu@inscitech.com.

Yours sincerely,  
INSCITECH, INC.



Elaine J. Chiu, M.D., Ph.D.

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